Fire & Fuels

The report covers fire and fuels monitoring, including fuels reduction and wildland fire subsections.

Fuels Reduction

Fuels reduction monitoring entails tracking the number of acres that were treated for hazardous fuels reduction through fire, mechanical treatment, and timber harvest activities, and disclosing how effective these treatments are in meeting resource objectives.

Monitoring Question

> How, where, and to what extent will prescribed fire and/or mechanical treatment be used to maintain desired fuel levels, mimic natural processes, maintain/improve vegetation conditions, or restore natural processes and functions to ecosystems?

The monitoring question was selected because it is the sole Forest Plan monitoring question associated with fuels reduction. The information gathered to answer this question can be utilized by managers to help determine the most appropriate treatment method(s) and location(s) to reduce hazardous fuel loadings and improve the natural processes of ecosystems within the Forest.

Forest Plan direction includes O-ID-2. Establish, maintain, or improve the condition of vegetation using prescribed fire, mechanical treatments, and other tools. O-ID-3. Treat areas of highest fire risk to minimize effects of unwanted wildland fire.O-ID-4. Reduce fuels and control vegetation in the under-story of stands that had naturally occurring low intensity surface fires.

These Forest Plan direction drivers were chosen because they provide guidance for fuels reduction, based on high hazard areas and improving condition class to historical conditions.

The units of measure used to address the monitoring question are: (1) Acres of high fire risk treated with burning, mechanical methods, and timber harvest. (2) Acres treated for ecological purposes using burning, mechanical methods, and timber harvest. (3) Fuels reduction (tons per acre) in prescribed burns and wildfires.

These measures are effective and appropriate because they are easily verifiable through field monitoring and the Forest Service Activity Tracking System (FACTS) database.

The Units of Comparison chosen were: Hazardous Fuels: (1) Decade 1 Projection-66,100 acres and (2) Fire: Ecological Objectives: Decade 1 Projection-6,200 acres. These units of comparison display how current accomplishments are approaching Forest Plan projections.

Monitoring Methods(s)

Fuels treatment acres are retrieved from various fuels databases including the National Fire Plan Operations and Reports System (NFPORS), FACTS, and Feat Fire monitoring Integrated (FFI).

To compare fuels reduction in prescribed burns outside the BWCAW, monitoring was conducted on units treated by underburning. This monitoring utilized pre and post burn fuels data collected using Brown's transects to measure fuel loadings (tons per acre) along with litter and duff depth. Pine mortality was also measured.

For fuels reduction monitoring in prescribed burn units inside the BWCAW, pre-established burn plots are periodically revisited to assess changes in hazardous fuel conditions (fuel loading and fuel structure or arrangement) and vegetation composition following burning. During 2009, five preexisting plots within the Cavity wildfire (burned in 2006) were re-measured. These plots occurred within planned prescribed burn units, which were consumed by the Cavity fire. Though these plots were burned in a wildfire, the plot data is useful to compare fire effects between wildfires and Rx burns.

Results

Acres Treated

The Forest completed 12,895 acres of hazardous fuels reduction during FY09. Of these acres treated, 4,826 acres were accomplished through prescribed fire. Prescribed burning within the BWCAW accounted for 3,062 acres, and included the Boot Lake, Wind Lake, and Four Mile prescribed burns. The remaining 1,764 acres were located outside of the BWCAW, and were scattered throughout the Forest.

The remaining 8,069 acres were treated by mechanical means such as shearing, pruning, and harvest. Timber harvest accounted for 3,280 acres of fuels reduction. The remaining 4,789 acres were accomplished by other mechanical methods.

Since 2004 approximately 72,000 acres of hazardous fuels have been treated with over one half accomplished through prescribed burning of 1999 blowdown fuels within the BWCAW. Accomplishments to date have achieved the Decade 1 Forest Plan projected fuel reduction acres.

Table 5.1 displays the number of acres treated for fuels reduction between 2004 and 2009 and the Forest Plan Final EIS estimated maximum acres approved for treatment in Decade 1 (Final EIS Table 2.5. P 2-31).

Table 5.1. Hazardous Fuels Reduction (2004 through 2009)				
	Wilderness	**Non Wilderness**		
Year	Prescribed Burning	Prescribed Burning	Timber Harvest	Non Harvest Methods
2004	6,643		690	
2005	13,972		2,025	
2006	16,936		3,006	
2007	90		5,442	
2008	0	5,271	5,109	
2009	3,062	1,764	3.280	4,789
Cumulative Sub Total	40,703	31,376		
Cumulative Total	72,079			
Final FP EIS Projection (Est. maximum acres)	72,300			

Fire Effects on Fuels Reduction (Wilderness)

Five pre-established burn plots were monitored within BWCAW Burn EIS (2000) units 245, 255, 262, and 268 during July 2009.

The Cavity wildfire initially reduced fuel loading (tons per acre), on average between 48 and 58 percent (range between an 18 percent increase and a 70 percent decrease). Data collected during 2009 showed that average fuel loadings remained at approximately 48 percent of pre burn conditions (range between a 4 percent increase and 88 percent reduction (Table 5.2). Fuel loading increased from 2005 levels in two of the five plots. The increased fuel loading in one of the plots can be attributed to snags falling into the plot (Figure 5.1.). One plot showed a further reduction in fuel loading compared to the immediate post burn survey. This can be attributed to decay of light to moderate fuels.

The degree of fuel reduction four years after the Cavity wildfire is very similar to fuels reduction observed with Rx burns monitored in 2008. The 2008 monitoring showed average fuels reduction associated with prescribed burning at 46 percent. See Figure 5.2.

Table 5.2. Fuel Loading or Accumulation at Cavity Fire monitoring plots in 2005 and 2009							
		Pre Burn	Immediate Post Burn (2005)		4 Years Post Burn (2009)		
Burn Unit #	Plot	Tons Per Acre	Tons Per Acre	% Change*	Tons Per Acre	% Change from Pre Burn*	% Change from Immediate*
245	3	71.0	30	58	28	60	7
255	1	52.0	43	18	54	-4	-25
262	1	27.0	8.5	70	10	63	-17
268	1	73.0	57	22	50	32	12
268	2	25.0	13	48	NA	NA	NA
268	3	42.0	13	70	5	88	61
Average		48	27	48	29	48	8

*Positive number indicates reduction in fuel loading.

Figure 5.1. Increase of fuel loading post burn due to snag recruitment

Figure 5.2. Prescribed burns reduced hazardous fuel loading by 46 percent on average. This is approximately the same percentage as four years following the Cavity Fire.

Fire Effects on Fuels Reduction (Non-wilderness)

Generally, the 1-1000 hour fuel loadings that were sampled from the underburn units showed a decrease of 50-55 percent in the tons/acre remaining. The duff depths were reduced by 95 percent, and litter depths were decreased by 40-80 percent. Mortality of the overstory pine within the units was limited to less than 5 percent.

Figure 5.3. The Tomahawk prescribed burn was designed to promote pine regeneration. This photo shows the burn area in 2009 before burning.

Figure 5.4. Tomahawk prescribed burn immediately following prescribed burn in 2009.

Figure 5.5. Tomahawk prescribed burn in 2010, one year after burning. Note pine over story survival.

Implications

Fire Effects on Fuels Reduction (Wilderness)

The extent to which fuels were reduced from the Cavity Fire was similar in 2009 to levels in 2005 (immediately following fire). There were changes within individual burn units over the four year period, but the overall reduction in tons per acre averaged 48 percent. Fuels increased in one plot where snags fell into the plot. Fuel loading decreases between 2005 and 2009 can be attributed to subsequent fuel decay.

Wildland Fires

This section describes the number of unwanted wildfires by causal category and acreage, and the number of wildfires that were allowed to burn for resource benefits.

Monitoring Question

> What level of wildland fire on the landscape is appropriate and desirable, and to what extent is unwanted wildland fire on the landscape suppressed?

This question was developed to track trends in the number of wildland fires and the causal agents that are occurring on the Forest. Fire managers can use this information to determine future needs within in the fire program, such as changes to prevention needs, changes to areas allowing fires to burn for resource improvement, changes for hazardous fuels treatments, etc.

This monitoring question addresses the following Forest Plan Desired Condition:

Forest Plan direction includes D-ID-6. The presence of wildland fire on the landscape is appropriate and desirable, but unwanted wildlife fire is actively suppressed where necessary to protect life, investments, and natural resources. The full range of appropriate management responses are considered for unwanted wildland fires.

This driver was chosen because it provides direction for tracking the number of wildfires that are suppressed and/or allowed to burn for resource benefits.

The units of measure selected included the number of wildfires by causal category and the number of wildfires suppressed versus managed for resource benefit. The unit of comparison these measures were evaluated against was the five year trend in number of wildfires and causal category.

These units of measure and comparison were chosen because they are easily verifiable through a Forest Service Wildfire data base (FIRESTAT database) and through individual fire reports.

Monitoring Method(s)

Tracking of wildland fires that have occurred on the Forest over the last 20 years was accomplished by reviewing the FIRESTAT database, which is the repository for individual fire reports. Individual reports were then entered into a spreadsheet that broke down the causal agent of the fire and the size of the fire; and identified if they were managed for resource improvement.

Results

Fire reports completed for each wildland fire that occurred within the protection area of the Superior National Forest show that there were 29 wildfires which burned a total of 15 acres during FY 2009. These figures were short of the 20 year average of 63 fires and 7371 acres for the Forest. The smallest fire was 0.1 acres, the largest 5 acres, and the average wildfire acreage burned was a half acre. The three fires that exceeded one acre were the results of escaped campfires.

The Forest Plan allows for management of lightning caused fires within certain portions of the Boundary Water Canoe Area Wilderness (BWCAW) to be managed for resource improvement. Of the fires that occurred in 2009, only three fires were caused by lightning. Of these three fires, Snow Bay was within an area that allowed for resource improvement. This fire was put into a monitor status as a management strategy to allow for resource improvement. The fire received heavy rains soon after discovery and reached a size of one-tenth of an acre before being declared out.

Table 5.3 displays FY 2009 fires, acres burned, and time of year for fires one acre or larger. Table 5.4 shows wildfire acres burned during the past five years and the 20 year average for each cause. Table 5.5 shows the number of wildfires by cause during the past five years and the 20 year average.

Table 5.3. 2009 Wildfires one acre or larger		
Fire	Acres Burned	Time of Year
Round Lake	5	May
Winton	2	May
Section 8	3.5	July

Table 5.4. Wildfire acres by cause from 2005 to 2009.						
Cause	2005	2006	2007	2008	2009	20 Year Avg
Lightning	1362.4	39969.4	27.1	21.6	0.3	2872
Equipment	0.0	7.2	0.0	0.2	0.1	2
Smoking	0.1	0.2	0.0	0.0	0.7	1
Campfire	45.2	8.9	75497.3	1.5	12.1	4416
Debris Burning	7.5	1.6	1.3	13.1	0.1	13
Railroad	0.0	3.1	0.0	0.0	0.0	37
Arson	5.5	0.0	0.0	0.0	0.5	9
Children	36.4	2.1	0.0	0.6	0.0	4
Misc.	90.5	2.9	0.7	3.9	1.1	19
TOTALS	1547.6	39995.4	75526.4	40.9	14.9	7372

Table 5.5. Number of wildfires by cause from 2005 to 2009						
Cause	2005	2006	2007	2008	2009	20 Year Avg
Lightning	20	80	53	7	3	19
Equipment	0	5	0	2	1	2
Smoking	1	1	0	0	5	1
Campfire	22	17	18	10	11	15
Debris Burning	6	6	4	5	1	7
Railroad	0	2	0	0	0	3
Arson	3	0	0	0	3	5
Children	4	2	0	2	0	2
Misc.	5	9	4	15	5	7
TOTALS	61	122	79	41	29	61

Implications

The results show that the major causal agents of wildland fire on the SNF are lightning and campfires. Of all the causal agents, only lightning caused fires can be considered desirable, and then only if they are located within the area of the BWCAW that allows for natural ignitions to be managed for resource improvement. The human caused fires are all considered unwanted and thus have an immediate suppression strategy.

Recommendations

1. The results show that campfires are an important contributor toward wildland fires. This indicates a possible need for increased prevention and education of forest visitors.

2. Continue and when possible enhance the integration of vegetation management practices and prescribed burning to reduce hazardous fuels within project areas across the Forest.